Thermodynamic Properties of n-Alkanes in the Liquid State

T.S. Khasanshin [C, S], A.P. Shchamialiou and O.G. Poddubskij
Mogilev State University of Foodstuffs, Mogilev, Belarus

The speed of sound was measured in the series of alkanes (C_nH_{2n+2}): n-hexane, n-octane, n-decane, n-dodecane, n-tridecane, n-tetradecane, n-pentadecane and n-hexadecane in the range of temperatures 303-433 K and pressures up to 50 MPa. Using our measurements and data of other authors the correlation between speed of sound and molecular structure of n-alkanes was investigated from n=5 to n=16 over the temperature range between 303 and 433 K at pressures 0.1-140 MPa. The method of calculation and prediction of the sound velocity in n-alkanes was offered. Simple asymptotic formula for the sound velocity as a function of the temperature, the pressure and the number of carbon atoms was derived. This formula can be used to calculate and predict the given property in the series of n-alkanes from pentane to higher homologues in the liquid state. A grid algorithm and computer program for calculation of thermodynamic properties of liquids from the sound velocity data were developed. Using this algorithm the tables of thermodynamic properties of alkanes C6-C16 in the range of temperatures 303-433 K and pressures 0.1-140 MPa were obtained. Sound velocity, density, heat capacity, compressibility, enthalpy and entropy are listed in the tables. It is also shown that the Tait equation can be used to represent density of alkanes from n-hexane (C6) to n-hexadecane (C16). The coefficients of the Tait equation are calculated. This equation describes available experimental density data with deviation of no more than 0.1%.